In re Application of: Ernest GRIMBERG
Serial No.: 10/567,438
Filed: February 7, 2006
Office Action Mailing Date: February 25, 2011

Examiner: Yara B. GREEN
Group Art Unit: 2884
Attorney Docket: **31322**
Confirmation No.: 5035

REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

Claims 62-64, 66-72, 74, 76-81 and 84 are in this Application. Claims 62-64, 66-72, 74, 76-81 and 84 have been rejected under 35 U.S.C. § 103. Claims 1-61, 65, 73, 75 and 82-83 have been canceled in a previous response. Claims 62, 68, 74 and 79 have been amended herewith.

Amendments To The Claims

35 U.S.C. § 103 Rejections

For clarity, Applicants are describing the teachings of *Butler*, *Tsuchimoto*, *Marshall*, *Everest* and *Frey* individually but are traversing the rejection with respect to the combination of these references, *infra*. That is, the Applicants are not attacking the references individually, rather addressing the combinations of references as set forth in the instant Office Action.

The Examiner rejected claims 62-64, 66-69, 71-72, 74, 76-80 and 84 as being unpatentable over US Pat. Appl. 2002/0074499 by Butler (hereinafter *Butler*) in view of US Pat. 5,944,701 by Tsuchimoto et al. (herein *Tsuchimoto*) and US Pat. 6,515,285 by Marshall et al (hereinafter *Marshall*). It is submitted in response that independent claims 62, 74 and 79, and the claims dependent thereon, are patentable, in the light of arguments set forth below.

The Examiner has agreed that *Butler* does not teach a separate function that corrects the object temperature by incorporating a sensor on the shutter, rather *Butler* uses the shutter information to correct non-uniformities amongst detector elements. The Examiner further agrees that *Tsuchimoto* does not explicitly disclose implementing an average video signal of the sensor array. The Examiner states that

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Tsuchimoto's quantity Q necessarily requires an average signal to accurately represent the offset of the array, and further cites *Marshall* as including these features.

While disagreeing with the rejections, in order to expedite prosecution Applicant hereby amends independent claim 62 to state:

> 62. An infra-red imaging camera comprising:
>
> an uncooled and unshielded detector comprising an array of infra-red (IR) sensors arranged to detect infra red radiated energy, said array comprising a plurality of IR sensors,
>
> a non-uniformity corrector, associated with said detector, operable to perform non-uniformity correction on outputs of said array to provide uniform outputs having a uniform response to energy detected at said uncooled sensor, and
>
> a calibrator to carry out periodic calibration operations by taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter, and to derive a reference temperature from said at least one calibration temperature measurement, said reference temperature being a temperature indicative of radiated energy not from an external scene, and a reference level comprising an average video signal of said IR sensors at the time of said calibration temperature measurement, said average being taken over said plurality of IR sensors, and to calculate a temperature of objects in said camera's field of view for each of said plurality of IR sensors from a difference between a respective uniform output of said sensor and said reference level, said temperature being calculated using a same signal to temperature function for each of said sensors, wherein said reference temperature is an offset of said function,
>
> *wherein said shutter is positioned between optics of said camera and said detector*. (Emphasis added.)

Corresponding amendments have been made to independent claims 74 and 79. Support is found *inter alia* on p. 15 lines 21-24 and Fig. 1 of the instant specification.

In contrast with the claimed embodiments, *Tsuchimoto* does not position the shutter between the optics and the IR sensor array. Instead *Tsuchimoto* locates the

shutter inside the optics. *Tsuchimoto* col. 4 lines 30-32 describe the location of the shutter within the optics:

> a shutter means disposed at a position adjacent an aperture stop in the optical system and nearer an incident aperture than the aperture stop;

Tsuchimoto's Figs. 1 and 2 show shutter 3 located between lenses 1a and 1b within the camera optics. Temperature sensor 5, which provides readings of the shutter temperature for *Tsuchimoto*'s temperature correction calculations, is adjacent to shutter 3.

By locating the shutter within the optics *Tsuchimoto* obtains the following effects:

1) The detector F# (numerical aperture) is much lower than the optics F# therefore the IR detector collects significantly more light than the amount passed through the optics. By locating the shutter inside the optics, only the light coming through the optics is blocked therefore the additional light coming from the detector package and internal camera parts is unchanged regardless of the position of the shutter. The detector output component resulting from the detector package and internal camera parts can therefore be easily eliminated from *Tsuchimoto*'s calculations.

2) By locating the shutter inside the optics at least part of the optical elements transmittance is automatically taken into consideration because the light emitted from the shutter passes through the optical parts.

3) The spectral band of the uncooled detectors is much wider (usually 7-14 microns) than the spectral band of standard optic lenses used for uncooled cameras which (usually 8-12 microns only). As a result of the increased spectral band, the video values obtained with an external shutter blocking the detector field of view are significantly larger than the video levels obtained with Tsuchimoto's internal shutter. In Tsuchimoto the optics blockades a

portion of the spectral band therefore the resulting IR detector signal is reduced.

The claimed embodiments relate to IR detectors optics that do not contain an internal shutter. Instead the shutter is located between the detector and the optics (denoted herein an external shutter). As a result the signal obtained from the shutter does not compensate for:

1) The difference in optics transmittance;
2) The difference in the spectral band; and
3) The difference on the numerical aperture (F#).

The shutter also significantly changes the additional energy collected by the IR detector from the surrounding internal camera parts.

The claimed embodiments are directed at IR cameras which do not include an internal shutter. As a result the shutter cannot be located "adjacent an aperture stop in the optical system and nearer an incident aperture than the aperture stop" as required by *Tsuchimoto*. The claimed embodiments provide a real-time function which corrects for these effects based on the average video signal and the reference temperature provided by the temperature sensor on the external shutter.

The deficiencies encountered by external shutter IR cameras cannot be corrected by *Tsuchimoto*, whose shutter temperature does not accurately reflect all the impinging IR radiation from the surroundings. Merely performing *Tsuchimoto*'s calculations upon signals obtained from an IR camera with a shutter located outside the optics will lead to inaccuracies, due to a failure to compensate for differences in F#, optical element transmittance and spectral band.

Neither *Butler* nor *Tsuchimoto* nor *Marshall*, alone or in combination, disclose *"taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter...wherein said shutter is positioned between optics of said*

camera and said detector". Thus neither *Butler* nor *Tsuchimoto* nor *Marshall*, alone or in combination, disclose all the limitations of claims 62, 74 and 79.

Applicant respectfully believes that the Examiner's objections are overcome by the present amendments.

It is believed that the dependent claims are allowable as being dependent on an allowable main claim. The specific objections against the dependent claims are therefore not responded to individually.

The Examiner rejected claim 70 as being unpatentable over *Butler* in view of *Tsuchimoto* and *Marshall*, and further in view of US Pat. 4,907,895 by Everest (herein *Everest*). It is submitted in response that claim 70 is patentable in the light of arguments set forth below.

The Examiner states that *Everest* teaches coating at least part of the internal side of a shutter so that it is highly reflective to the infrared radiation generated by the shutter, and that it would be obvious to a person skilled in the art to apply this to *Butler* as modified by *Tsuchimoto* and *Marshall*. Neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Everest*, alone or in combination, disclose *"taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter...wherein said shutter is positioned between optics of said camera and said detector*". Thus neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Everest*, alone or in combination, disclose all the limitations of claim 70.

It is therefore submitted that claim 70 is both novel and inventive over the cited prior art.

The Examiner rejected claim 81 as being unpatentable over *Butler* in view of *Tsuchimoto* and *Marshall*, and further in view of US Pat. 5,925,875 by Frey (herein

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Frey). It is submitted in response that claim 81 is patentable in the light of arguments set forth below.

The Examiner states that *Frey* teaches using a high pass filter in conjunction with a focal plan array in order to remove unwanted temporal noise and fixed pattern noise components of an image signal, and that it would be obvious to a person skilled in the art to apply this feature to the method of *Butler* as modified by *Tsuchimoto* and *Marshall*. Neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Frey*, alone or in combination, disclose "*taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter...wherein said shutter is positioned between optics of said camera and said detector*". Thus neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Frey*, alone or in combination, disclose all the limitations of claim 81.

It is therefore submitted that claim 81 is both novel and inventive over the cited prior art.

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Conclusion

In view of the above amendments and remarks it is respectfully submitted that claims 62-64, 66-72, 74, 76-81 and 84 are now in condition for allowance. A prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,

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